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December 1, 2009

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:	)	
	)	
International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act	))	GN Docket No. 09-47
	)	
A National Broadband Plan for Our Future	)	
	)	GN Docket No. 09-51
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act	)))))	GN Docket No. 09-137

NBP Public Notice # 14

COMMENTS OF THE NATIONAL ASSOCIATION OF STATE EMERGENCY MEDICAL SERVICES OFFICIALS - NBP PUBLIC NOTICE #14

The National Association of State Emergency Medical Services Officials (NASEMSO) hereby submits its Comments in response to the Federal Communications Commission's ("FCC" or "Commission") November 2, 2009 Public Notice ("*Notice*") in the above-referenced proceeding.[1] As part of the *Notice*, the FCC seeks comment on issues related to broadband deployment for public safety in rural and tribal areas and broadband and it is on those that these comments focus (NBP Public Notice # 14).

[1] *Comment Sought on Public Safety Issues Related to Broadband Deployment in Rural and Tribal Areas and Broadband Communications to and from Persons with Disabilities – NBP Public Notice #14*, Public Notice, DA 09-2369 (rel. Nov. 2, 2009) ("*Notice*").

Our Association is an active member of the Public Safety Spectrum Trust (PSST), the FCC's selected Public Safety Broadband Licensee (PSBL). We have therefore participated in the formulation and approval of the Comments in response to NBP Public Notice #14 that the PSST has submitted. Nothing in this filing diminishes the importance of the considerations that constitute the Comments submitted by the PSST. We are elaborating upon some concepts important to the emergency medical services (EMS) community in this nation consistent with the NASEMSO presentation at the Commission's field hearing on November 12th, 2009 on public safety broadband needs.

The future of EMS communications is broadband. To save time in life-threatening situations, it is essential to use technologies now available or in development to send data in addition to voice communications. Fast, robust data communications will enable EMS professionals to have a level of situational awareness (a real-time understanding of all events and resources impacting response, patient care, and transport) and a common operating picture (all responders and hospital staff involved in an EMS call share the same understanding and expectations for what is occurring) not possible today. In this way, life-threatened patients may be more quickly brought to the attention of the EMS system, and responders will be better informed and more quickly able to make decisions about appropriate emergency treatment and transportation. The aging VHF, UHF, and trunked systems used by EMS for the past 35 years will not support these data communications. While EMS providers in urban areas may be able to take advantage of 4.9 GHz public safety broadband systems, the rest of the national EMS community will be unable to support their patients' needs this way. Commercial wireless and unlicensed municipal systems may serve some limited roles in these communications; however the ability of EMS personnel in the field to transmit life-critical data to a physician directing them from an emergency room cannot afford the delay that any system failure or transmission rate slowdown could cause. Being able to utilize the combined capabilities of 4.9 GHz and a new 700 MHz national broadband network, with existing and new telemedicine and other fiber networks, will assure the EMS community the broadband transmission capabilities that it needs in both urban and rural settings to provide advanced emergency care and to assist community health systems fill other potential gaps.

Public Safety Broadband Deployment in Rural and Tribal Areas

1. Are adequate broadband services available for public safety use in rural and tribal areas?

No. Broadband services are currently of inadequate quantity and quality for public safety use in rural areas in general and for EMS mission critical use specifically. The mission of rural EMS routinely requires the transporting patients long distances across remote territories where cellular communications, let alone broadband service, are not commercially viable. In many instances, these territories have lapses in the aging EMS VHF/UHF land mobile radio service as well which, at its most functional, does not support broadband applications for emerging EMS technologies. These circumstances often lead rural ambulance providers to install cellular, land mobile radio, and expensive satellite radio units in their vehicles, none of which have been broadband capable. While urban EMS providers are beginning to use commercial wireless broadband and unlicensed municipal broadband systems for sending electronic prehospital care record (PCR) data back to their headquarters for processing and patient video to receiving hospitals for consultation purposes, rural services do not have these capabilities. The only licensed public safety broadband, 4.9 GHz, is hotspot technology with limited rural EMS application. In the future, intelligent transportation system (ITS) networks using linked 5.9 GHz Dedicated Short-Range Communications (DSRC) may offer EMS alternative broadband support along major roadways, but not elsewhere in rural areas.

Not only is the quantity of broadband service lacking in rural areas but its quality, where it does exist, cannot allow it to be used for mission critical EMS operations. Current EMS communications require immediate, and often lengthy, access to physician consultation. This may include the transmission of biotelemetry and, in the future, the transmission of multi-vital sign, video and imaging data requiring broadband support. In rural areas, where transport times may be forty minutes to two hours or more, access and reliable connectivity are critical. The minute to minute variability of throughput available in commercial broadband services, the lack of priority use for EMS in access to that throughput, the fragility of non-hardened infrastructure and broadband networks (e.g. BlackBerry network crashes in recent years for hours at a time), and security issues all contribute to a lack of commercial wireless utility for mission critical EMS operations.

2. What broadband applications and services are most important to public safety agencies operating in rural and tribal areas?

The following is drawn from two national EMS communications planning efforts over the past five years. One was led by the Intelligent Transportation Society of America's Public Safety Advisory Group (an informal practitioner input group of the US Department of Transportation), and the other by a partnership of NASEMSO and the National Association of EMS Physicians (NAEMSP) under the aegis of the EMS Working Group of the National Public Safety Telecommunications Council (NPSTC). The latter will result in a paper to be published in January, 2010.

Both of these efforts recognize that current EMS communications have not significantly evolved since their origin over 35 years ago. These systems remain primarily land mobile radio, voice based applications on an aging VHF/UHF infrastructure that will be further challenged by the narrowbanding process culminating in 2013. Therefore, outside of some experimental and pilot applications, broadband has not been a reality for rural EMS. These two national initiatives sought to assess the weaknesses in the EMS communications system, predict future EMS technology adoption, and begin to predict the communications implications (e.g. bandwidth and infrastructure needs). The following reflect those findings. Because of a shortage of resources, these efforts are bountiful in predicted technology use for suggesting communications needs, but do not yet quantify those needs beyond some throughput estimates. This quantification is being pursued.

Situational Awareness and Common Operating Picture Improvement

Over the past 35 years, EMS communications have comprised dispatch messages, coordination messages with other responders, and voice and biotelemetry messaging with hospital staff. With longer patient transports in rural areas, it is not uncommon for there to be several ambulance/hospital exchanges during a transport, providing updates or seeking new orders in response to changes in patient condition. In years past, this messaging could be done at a fairly leisurely pace because neither rural ambulance crews nor small rural emergency department (ED) staffs were particularly over-taxed. Time could be taken for medical overseers at the hospital to fully understand the patient's situation before issuing medical orders.

In more recent years, small rural hospitals have closed in great numbers, centralizing emergency department services in larger hospitals further away. The result is longer ambulance transports and increasing patient and EMS communications volumes in those hospitals. Those small rural hospitals that remain are often "critical access hospitals" (CAHs) which have limited ability to care for longer term patients, thus increasing EMS transport numbers through transfers to larger hospitals. These CAHs chronically suffer from funding limitations and often may have no more than one physician and one nurse in the ED, who may have responsibilities elsewhere in the hospital when no patients are present, and may become overwhelmed by a car crash with multiple patients. Additionally, EMS call volumes have generally increased each year nationally. Emergency department volumes have done the same, particularly with changes in the pattern, availability and use of primary care (e.g. greater numbers using EDs as the source of primary care). The concern about disease outbreaks, such as H1N1, has exacerbated this. The result of all of these developments is busier EMS crews and busier ED staffs with less time and ability to communicate with one another. Further, there are no generally available systems through which these providers may access real-time information about events and resource status that may affect their work. For instance, an EMS crew may have no information on the number and severity of the patients to whom they are responding until they arrive at the scene, no information about the availability of air medical or extrication resources until they actually call for them, and no information about the availability of the hospital to which they want to transport until they call that hospital.

In the future, it will be necessary to develop networks of databases that contain information about events and resources updated in real-time and accessible through a user friendly, GIS capable interface on PDAs carried by responders and physicians, mobile data terminals in EMS vehicles, and desktop units at responders' bases of operations, dispatch centers, and hospitals. Diagram 1 depicts such an interface screen. The screen represents the jurisdiction of the user, and events and resources within that area. Information not readily available on the initial screen can be obtained by selecting an icon and drilling down.

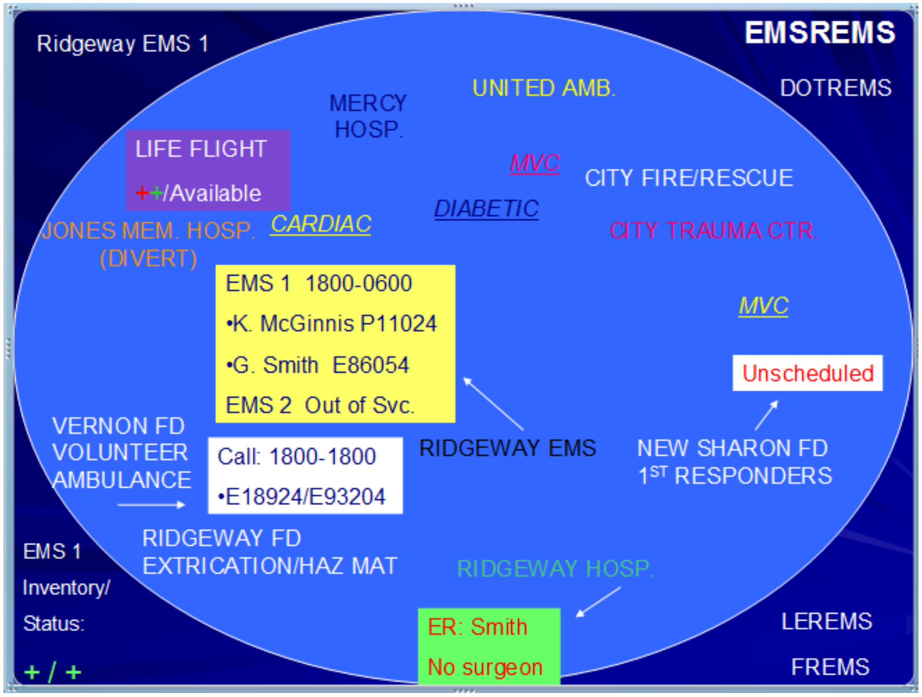

Diagram 1

Diagram 2

Ad hoc databases will be created each time a patient is encountered. Multi-vital signs, video, electronic health record, and voice to text translation of medic findings will be pushed to those databases and parked until the intended recipient (e.g. an incoming air medical crew or a medical direction physician in the hospital) is available to review them (Diagram 2). These recipients can then pull down that data to their own screen (see Diagram 3) and push queries or orders back to the EMS crew for consumption when they are available. When an emergency dictates, either party could break into the other's process and revert to voice and data communication as needed.

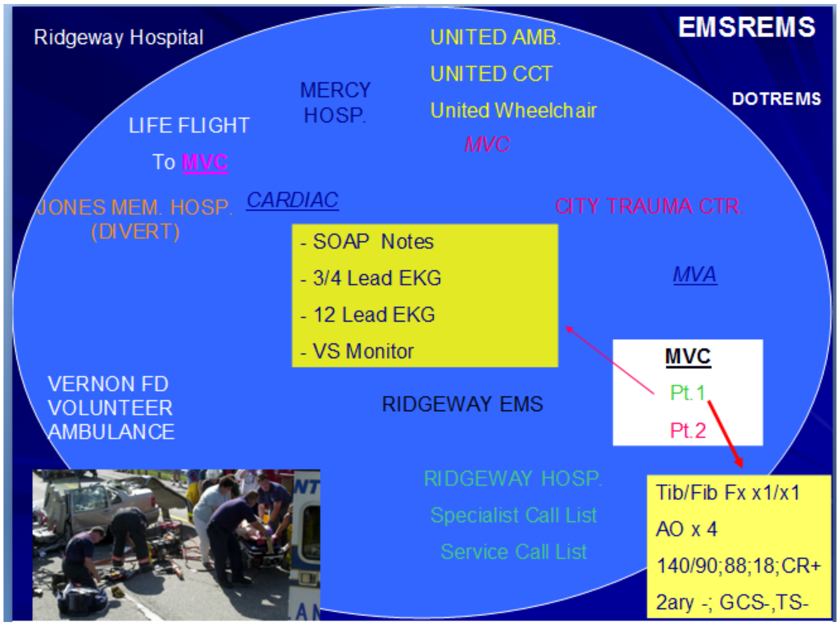

Diagram 3

In this system, everyone involved will have all the information they need on events and resource status necessary to manage the patient's needs (situational awareness) and the same expectations about the process of the event (common operating picture). Without this system, EMS care will continue to erode in these regards.

Medical Quality Video and Imaging

The use of video to send patient images from the scene or ambulance to a physician consultant/medical director is being used currently in Texas[2], Arizona[3] and Louisiana[4]. While the utility of video in EMS remains an open question in the national EMS community, it is more likely to have a role in rural settings than in urban settings for two reasons.

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[2] DREAMS Ambulance Project: http://tees.tamu.edu/index.jsp?page=feature_dreams

[3] http://www.emsresponder.com/print/EMS-Magazine/Telemedicine-Becoming-Reality-for-Prehospital-EMS/1$5340

First, urban systems have high call volumes, and can afford highly trained EMS personnel (paramedics) who have a high level of patient interaction experience. The reality of a large call volume, short transport times to hospitals, and the training and experience of the personnel mean that real emergencies are dealt with effectively and that subtleties in signs and symptoms that may become a treatment factor later can be managed by a physician in the ED after a few minutes' transport. Rural areas often do not have the call volume to be able to afford the cost of paramedic-level personnel or to provide sufficient experience to maintain an effective practice. Transport times are relatively long and subtle signs and symptoms that may not be appreciated by personnel with a lesser amount of training and experience may become a treatment factor before arrival at the hospital. Therefore, in urban areas injecting the expense and process of video transmission may not be as value-added as it could be in rural areas where the interpretive eye of an emergency physician to view the patient, or portable CT images (e.g. to determine the type of stroke a patient is suffering) or portable ultrasound video/images of the patient (e.g. to determine the presence of internal bleeding), may make a critical difference in treatment and how/where the patient is transported. Today, satellite-based and wired broadband audio/video/imaging systems operate in military and civilian applications to link remote/rural medical facilities with specialists in urban centers to provide intensive care monitoring and treatment and "tele-trauma" consultation. The public safety broadband network, including satellite back-up and node links to telemedicine and other fiber networks, could wirelessly provide these capabilities to ambulance and rural hospital/clinic personnel to effectively intervene in life-threatening situations that they would otherwise not be adequately trained or experienced to accomplish.

Second, an emerging concept in rural EMS and health care is "community paramedicine". Under a widely discussed "medical home" concept of implementation and financing, paramedics and other

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[4] http://www.emsresponder.com/web/online/ED-Industry-Wire/Baton-Rouges-Launches-EMS-Telemedicine-Program/33$9279

EMTs could become affordable in rural communities because they not only provide advanced life support services, but help to fill gaps in primary health care services. Working in and out of rural clinics and hospitals, paramedics and other EMTs could provide preventive care services in the community and other primary care and follow-up services in patient homes. They would be responsible for patient remote monitoring and for visiting patients in their homes thereby reducing the need for clinic visits and catching incipient problems before they necessitate an ambulance call, clinic or ED visit. They would be able to respond to some "emergency" calls and be able to address the patient's needs without transport to a hospital (one study suggests that transports could be reduced by 15% with such a system in an urban setting)[5]. Because it would not be cost-effective to train these EMS providers at a level to make them independent practitioners, the ability to wirelessly video-consult with physicians and mid-level practitioners in rural clinics and hospitals will become crucial for the benefits of community paramedicine to be robustly realized. This concept projects a need for on-going and frequent broadband utilization by EMS in rural areas in years to come. Video requirements are estimated to be in the 1 to 5 mbps range with medical quality video in the high end of that range. For imaging throughput requirements, the FCC's new consultant on telemedicine/broadband health care issues, Dr. Mohit Kaushal, recently stated in a blog: "The technology exists so that they could pull up that diagnostic image in real time, from the imaging center where it was performed. But such technology requires a 100 mbps broadband connection -- a fiber connection -- which many hospitals lack."[6] We are still seeking imaging requirements for wireless transmission and hope that this estimate does not accurately preclude mobile broadband transmission of EMS derived imaging..

[5] http://www.ncbi.nlm.nih.gov/pubmed/12385614 . Prehospital Emergency Care. 2002 Oct-Dec;6(4):445-8
[6] Broadband Gaps in the Healthcare Sector, November 25th, 2009 by Mohit Kaushal, Digital Healthcare Director

Other EMS Applications

The following are other, specific technology applications with broadband implications that the two national EMS communications initiatives have suggested:

- Patient Multi-Vital Signs Monitoring: The ability to attach one or more micro-monitors to a patient to wirelessly receive and transmit electrocardiograph, capnography, blood pressure, and other vital signs packaged for display in a database. One project, by the Johns Hopkins Applied Physics Lab, suggested that simple multi-vital signs transmission require 76 kbps per sending unit and demonstrated a system that could monitor twenty wireless patient sending units per receiver at a time in a mass casualty situation.[7]

- Responder Multi-Vital Signs Monitoring: Similar to the Patient Multi-Vital Sign Monitoring, but intended for use by EMS responders monitoring fire, police and other responders in hazardous circumstances (e.g. firefighters inside a burning building; SWAT team members inside a building in a hostage taking scenario). This could also be used to detect chemicals, gases, radioactivity and other hazards being encountered by monitored responders.

- Stand Off Vital Signs Monitoring: The ability to wirelessly detect, receive and wirelessly transmit multiple vital signs to a database without physically touching the patient.

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[7] http://www.jhuapl.edu/AID-N/ . http://blog.xbow.com/xblog/2007/08/aid-n---advance.html

– Infrared Crowd Disease Detection: The ability to wirelessly scan, receive and transmit to a database the body temperatures (and body area temperatures) of individuals in crowds which suggest illness.

– Wireless Speech to Text Translation: The ability to speak into a microphone in a noisy emergency scene environment and have that speech translated and wirelessly transmitted into an ad hoc patient event database for real-time review by others on the scene, coming to the scene, or in a hospital ED supervising care at the scene.

– Receipt of Patient Electronic Record in Real-Time: The ability of on-scene EMS staff to receive and potentially manipulate (to focus on pertinent records only) medical history for their patients either wirelessly from a regional health care medical record system (like that piloted in Indianapolis in the past year[8]) or by patient-carried data records (like electronic dog tags being piloted in the military[9]).

– Creation of Ad Hoc Multi-Component Patient Databases: This is simply starting as transmission of electronic patient care reports to hospitals before the patient arrives, augmented by separate transmissions of 12 lead electrocardiophy and simple vital sign transmission. Using technologies described above, the ability to create in a single user interface window, data sent wirelessly from the scene that includes video, multi-vital signs, voice-to-text translated patient notes, and pertinent patient history components. This database could be made available in real-time to authorized responders (e.g. incoming airmedical crews who will transport the patient),

[8] http://www.medicine.indiana.edu/news_releases/viewRelease.php4?art=1114

specialists guiding care remotely (e.g. trauma surgeons directing a specialized procedure in the field), and emergency physicians routinely supervising EMS calls.

– EMS-Mediated Remote Patient Monitoring Systems and "Just-In-Time" Patient Warning and Reference Guidance: In community paramedicine and other settings, patients with post hospital discharge and/or chronic health monitoring needs can be remotely followed through the use of multi-vital signs monitors (as described above), video, or specialized monitors appropriate to their condition. These could be monitored at EMS dispatch and/or nurse advice service centers and would have alarms should the vital sign(s) monitored go outside a preset range. While this could be done by wireline service in most settings, though less so in rural areas, the ability to rebroadcast the monitoring device transmissions to responding EMS crews would need to be wireless. In addition, based on the patient history and current monitoring results, care warnings pertinent to that patient and condition, along with other relevant reference or medical protocol guidance, could automatically be sent to EMS responders in real-time. In a similar fashion, "I've fallen and can't get up" emergency alerting systems, currently wireline dependent and plaguing responders as a common source of false alarms, could be set up with audio-video and vital signs monitoring interfaces with not only wireline support but wireless retransmission to responding EMS crews.

– Advanced Automatic Crash Notification (AACN) Data Rebroadcasting and "Just in Time Training" and Reference Material Rebroadcasting: AACN has the potential to significantly reduce death and disability in rural car crashes by eliminating the time

[9] http://www.tatrc.org/?p=projects/eic

now required to "discover" that the crash has occurred, the time required to determine the physical location of the crash, and the time now required to respond to a crash and determine that specialty response (e.g. extrication, air medical evacuation) is needed. To take optimum advantage of these potential time savings, the AACN data should be simultaneously transmitted to all potential responders, and hospital and specialty care facilities that have requested to be notified of crashes exceeding a certain severity in a specific geographic area. In addition, certain crash data needs to be automatically assessed and resulting information transmitted to responders and facilities based on the assessment. For example, speed/rollover/ impact-vector data may be among data used to determine the severity of the crash and result in automatic dispatch of airmedical and other specialty responders and notification of trauma centers (see Diagram 4). Other vehicle data such as vehicle type and year/speed/rollover/impact-vector could be used to send an electronic vehicle access manual to responding extrication crews with diagrams and methods for best accessing patients and avoiding hazards in that vehicle (see Diagram 5).

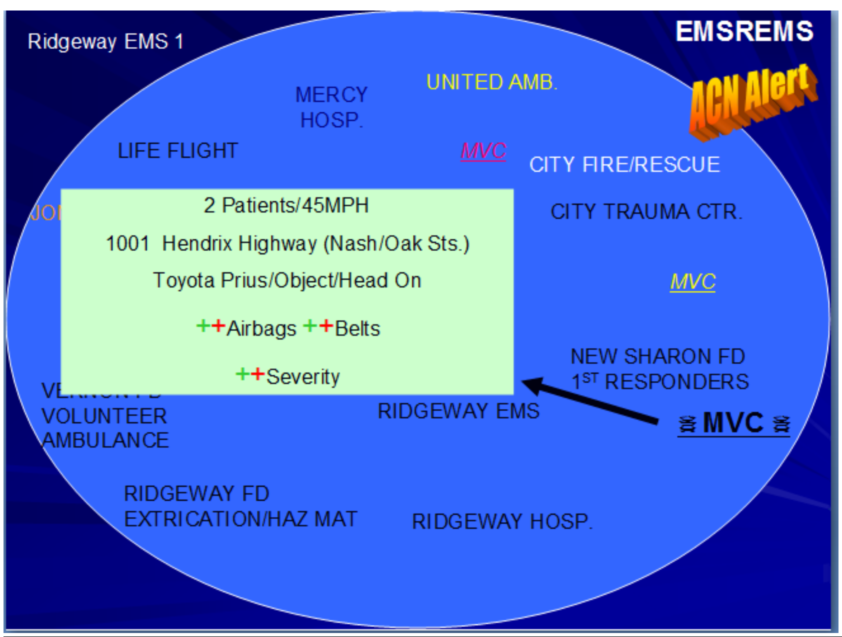

Diagram 4

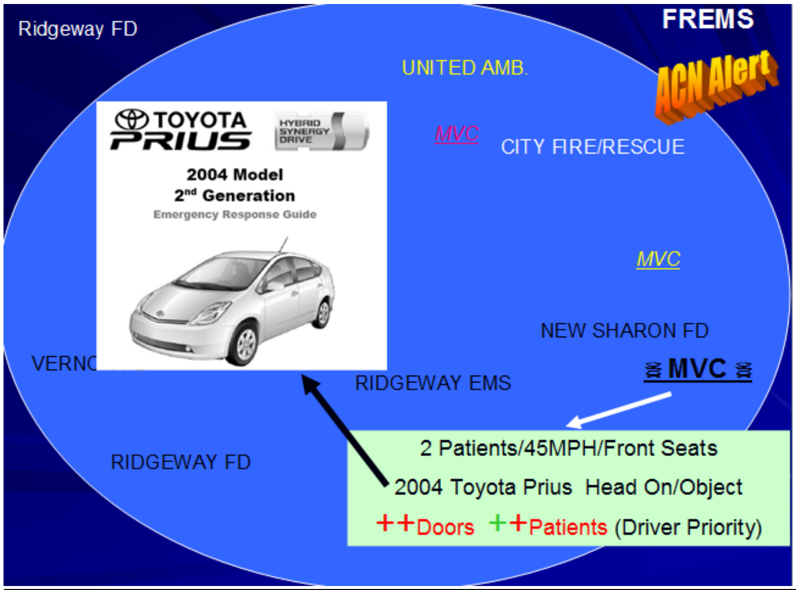

Diagram 5

– Closed Circuit Television (CCTV) Scene Transmission: Wireless receipt of live video feeds of an emergency scene from traffic, police, homeland security and other public monitoring CCTV systems by responding crews will help plan approach and vehicle staging at the scene.

– Robotic Remote Hazard Suppression and Patient Extrication: The use of remotely controlled robots to defuse/suppress hazards and remove patients from hazardous settings. This application requires audio, video, and robot-control data transmission.

– Wireless Vehicle Systems, Equipment and Supply Monitoring: The ability now exists to monitor virtually every critical system of a public safety vehicle. Radio frequency identification (RFID) and other tagging device technology make it possible to track the inventory of equipment and supplies in a vehicle. Wirelessly transmitting this information to the vehicle operator's communications unit, with event-linked special warnings (e.g. sending a "leaving scene to transport to hospital" message while a critical patient care device is registered as not having been returned to the vehicle; transmitting an "en route to scene" message with a critically low air pressure in a tire or low inventory of a critical supply) would reduce delays in restocking and inventorying vehicles and medical errors caused by missing equipment or supplies.

– Syndromic Surveillance and Quick Alerting to Specific Populations: Real-time transmission of dispatch and PCR data to monitoring systems which assess for specific patterns of patient complaints, signs and symptoms in specific geographic areas. Transmission of these assessments to EMS responders and public health authorities when specific outbreak or hazardous event occurrence is predicted.

3. Are there an adequate number of high-capacity (wireline or wireless) broadband connections linking together critical public safety facilities (*e.g.*, police stations, fire departments, PSAPs, emergency operations centers, hospitals) in rural and tribal areas?

No. High-capacity broadband linkages between ambulances of any sort and the hospitals and physicians with whom they must communicate are virtually non-existent in rural areas. Pilot uses of unlicensed (2.4 GHz) broadband, commercial wireless networks, and public safety licensed (4.9 MHz) broadband are limited to urban settings because of transmission distance limitations. Traditional EMS land mobile radio is not broadband capable.

4. How can the Commission ensure that rural and tribal areas are built-out as part of a nationwide 700 MHz wireless public safety broadband network? What incentives can be provided?

The Public Safety Spectrum Trust (PSST) has proposed the use of public/private partnerships, the secondary use of the spectrum by commercial users, and expanding the definition of public safety users to include "critical infrastructure" users such as hospitals (for uses in addition to their qualifying EMS role), some utilities, and transportation. We emphasize our support for these concepts as means of broadening participation and therefore lowering deployment costs. We also support the Commission's satellite capability requirements for the 700 MHz public/private partnership to ensure broadband coverage in rural areas. We encourage the Commission to consider means of employing the 700 MHz and 4.9 GHz systems to allow wireless access to existing and planned telemedicine and other fiber networks to leverage those resources to boost rural transmission distances complimentary to the need for tower construction. Enabling all EMS providers and other public safety colleague disciplines to have access to Universal Service Funds, perhaps through incentives to build out in the 700 MHz system or to link it to existing or planned fiber networks as described above, would be beneficial to rural public safety. Similarly, the National Telecommunications and Information Administration ("NTIA") or the Rural Utilities Service ("RUS") might be able to facilitate public safety use of new facilities or networks built with broadband stimulus funding in remote areas. For example, it could require grant recipients to provide priority access to public safety entities during emergencies.

5. How can the Commission ensure that, as other national public safety initiatives (*e.g.*, NG911) go forward requiring wireline or wireless broadband facilities, the requirements of rural and tribal areas are met?

The Commission should seek changes in current funding sources (e.g. the Universal Service Fund), leveraging networks created through other funding opportunities in rural areas (e.g. broadband stimulus funding through NTIA and RUS, previous telemedicine fiber systems), and the creation of new sources through executive branch budgeting or legislative action to afford financial incentives for those seeking to build out broadband systems which benefit public safety (and perhaps make public broadband possible in unserved or underserved areas) or wishing to become commercial partners in a public/private partnership build out of the 700 MHz system.

6. Are there synergies in the broadband backbone architecture of the nationwide 700 MHZ wireless public safety network with other needs for wireline broadband facilities in rural and tribal areas?

Creating 700 MHz access links to telemedicine and other fiber networks for EMS to transmit to rural clinics/hospitals and urban hospitals/specialty centers also creates opportunities for rural health care facilities to use telemedicine connections with other facilities they may not now have. Similar wireless/fiber connections for broadband purposes may create opportunities for other commercial and public service broadband.

7. Should commercial providers be required to provide public safety users with priority access to commercial broadband wireless and wireline facilities to the extent they are deployed within rural and tribal regions?

Yes. The Commission was correct when it created priority access requirements for the 700 MHz national public safety broadband network. Transmission breaks, packet loss, slow-downs or other degradation cannot be tolerated in mission critical public safety communications. Critical multi-vital signs or other monitoring or imaging data errors could result in misinterpretation of a patient's condition and subsequent medical errors causing patient harm.

8. How would the spectrum demands of rural or tribal public safety broadband networks differ from those of networks operating in more densely populated areas? What can be done to ensure that the spectrum demands of rural and tribal public safety broadband networks are met, and that such networks are readily capable of being upgraded or expanded to support the many bandwidth intensive, technologically advanced broadband applications and services that public safety users may adopt in the future?

As previously described, while other public safety broadband use may be expected to be less in rural settings than in urban settings, the opposite may well be true for EMS. Between the use of video and other applications described above in true emergencies to provide adequate supervision of rural EMS providers on long transports, and their use in community paramedicine settings to sort out emergencies from non-emergencies and to provide care to prevent emergencies, EMS will have a constant need for broadband support. These types of uses will generally decline from frontier to rural to suburban to urban settings while some applications (e.g. situational awareness and common operating picture enhancing capabilities described above, electronic patient record access from the scene, and PCR transmission from ambulance to hospital) may be heavily used in urban EMS settings.

9. Can unlicensed technologies, such as Wi-Fi, or licensed-light services, such as in the 3650 MHz band, play a role in public safety broadband deployment in rural or tribal areas? How might these technologies and services be made interoperable via the Internet or gateways with 4G technologies such as LTE or WiMAX deployed elsewhere? Can these technologies meet the security needs and provide other features that are required for public safety communications?

These networks may have potential to enhance the 700 MHz public safety broadband network but could not replace it. They lack the wide area coverage, transmission length, redundancy, reliability, public safety priority, security, and hardening required for mission critical public safety applications. They certainly could play a role in administrative and other applications which are not mission critical, and might be built in such a way that they could serve as the node described above for wireless access to telemedicine and other fiber networks if reliability, security and other issues could be addressed.

10. Would different technical restrictions (such as higher permitted transmitter power levels, and higher permitted cell sites) be appropriate for network deployment in rural or tribal areas? Under what conditions should these different restrictions apply and what should they be? We note that commercial wireless systems are already permitted to use somewhat higher power in rural areas. Also, what can be done to improve two-way wireless communications in rural or remote areas, where finding a return path for communications back to the transmitter may be difficult for operators of low-power, low-altitude handsets?

Yes. Rural public safety broadband systems should be able to use higher permitted transmitter power levels and higher permitted cell sites. These should especially be considered for portable and mobile transmitters to access the telemedicine and other fiber nodes describes above as a distance boosting device for rural EMS broadband.

11. Should rural and tribal public safety entities be permitted to enter into partnerships to share spectrum or infrastructure, such as with federal agencies, commercial providers, or critical infrastructure providers? How should the Commission's control rules and precedent be applied to such partnerships, or be modified to accommodate such partnerships, and how should network access (*i.e.*, for public safety communications) be prioritized?

Yes. As previously described, the Commission should enable a broad range of critical infrastructure users of the public safety broadband system and should encourage public/private partnerships between public safety and commercial providers to leverage commercial use of the network to fund build out and public safety use of the network. Any such arrangement must assure public safety priority access at all times.

12. Are there any means for rural or tribal public safety agencies to obtain access to commercially licensed spectrum or associated infrastructure? Are there opportunities to acquire spectrum through secondary market transactions (*e.g.*, the partition or disaggregation of licenses or spectrum leasing) or other arrangements with commercial licensees? Are there existing or planned municipal wireless networks in rural or tribal areas that may be leveraged for public safety use?

We are unaware of EMS systems with the resources to buy commercially licensed spectrum or infrastructure for a broadband network.

15. What role can deployments in the 4.9 GHz band play in augmenting public safety broadband communications in rural or tribal areas, particularly during emergencies or other large-scale events? What needs to be done to ensure that deployment of 4.9 GHz technologies occurs in rural and tribal areas?

We see two potential uses of 4.9 GHz in rural EMS. The first, described previously, would be nodes (antenna and wired links) to telemedicine or other fiber passing through rural areas between clinics and hospitals, rural and urban hospitals, and/or between other users. These nodes might require driving to and "dumping" data for transmission and then proceeding past other nodes for further data communication en route to the hospital. Perhaps commercial fiber might be required to play a secondary role in allowing home nodes for EMS to transmit data to primary telemedicine or other fiber networks or to the public safety broadband network. The second use of 4.9 GHz would be in routine monitoring of public safety responders in hazardous settings by EMS. Hotspot technology paired with portable bidirectional repeater units could allow firefighters in burning buildings and police officers in SWAT situations to be remotely monitored for health indicators such as vital signs and hazardous substance detection. Also, large scale events could utilize 4.9 GHz hotspot technology for multiple patient and responder monitoring as well many of the other applications discussed in question #2 above.

16. To what extent can satellite broadband technologies fulfill the communications needs—including the need for mission critical voice—of rural and tribal public safety entities? From the user's perspective, are there drawbacks to significant reliance on satellite-based technologies for broadband capabilities? Are there any barriers to the use of such technologies that need to be resolved? If so, what are they and how can they be addressed?

We support the FCC's encouragement of satellite use for augmenting the national public safety broadband network and support continued requirement of dual-function device availability to support both 700 MHz and satellite communications. The primary drawbacks to reliance on satellite communications use in the past have been a lack of broadband capability and the cost to use it. In rural EMS settings it has often been necessary to have multiple communications devices (e.g. UHF, VHF, cell phone and satellite phone) to overcome dead reception areas. The Commission should do what it can to facilitate introduction of software defined, adaptive, cognitive, intelligent, and multi-band radio technologies to enable rural providers to quickly and effectively establish a needed communications connection without using multiple devices or, conceivably, not knowing or caring about which frequency/network is finally employed for a particular communications exchange.

17. Are there existing programs, administered through the FCC or other agencies (*e.g.*, Department of Agriculture's Rural Utilities Service), that could spur deployment for public safety broadband communications in rural or tribal areas? What can be done to improve these programs?

As previously discussed, the Universal Service Fund (already extended for use by some health care and EMS providers, but not all) should be considered as a means of supporting public safety broadband network build out and public/private partnership incentivization as envisioned by the PSST. Its stated purpose to facilitate access to advanced telecommunications and information services in all regions of the nation, particularly in rural and high cost areas, at just, reasonable, and affordable rates[10] is absolutely aligned with this use. It is the cost of build out and servicing the public safety broadband network in rural areas that makes public/private partnerships to cover those areas a difficult "rural and high cost" proposition (and jeopardizes the potential success of the whole nationwide approach to interoperability in public safety broadband). As also previously described the NTIA and RUS could utilize broadband stimulus funding (the Broadband Technology Opportunities Program or the Broadband Initiatives Program) to directly incentivize building the public safety network in rural areas; or indirectly require systems that have used these funds to build networks to allow public safety use to augment build out in rural areas. While never embraced by Congressional or Executive branch discussants of the 700 MHz, the FCC should spare no resources it has as a commission to encourage a federal budget for the purpose of public safety broadband build out. Because it hasn't doesn't mean it can't or shouldn't.

18. What sources of funding for rural and tribal public safety broadband deployments are available? Are there novel funding mechanisms that should be explored?

As described previously, the ability to connect wireless public safety broadband to telemedicine or other fiber links, existing or planned, should be explored. This research should include financial incentives for making this happen. This exploration might be extended to making commercial fiber available to public safety through 700 MHz/4.9 GHz nodes. This might allow for broadband transmission from buildings served by commercial cable.

Another area to be explored would be allowing public safety access to 5.9 GHz ITS Dedicated Short-Range Communications along major roadways to extend its reach through those networked systems.

Respectfully Submitted,

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[10] 47 U.S.C. § 254(b)